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W Series Stirred Baths and Circulators

KD & KA Stirrer/Controller

ZD & ZA Stirrer/Controller

TD & TA Immersion Thermostats

CG Refrigerated Immersion Coolers

User Manual

User Manual for W Series Stirred Baths

| Product | Description |
|---------|--|
| W6-KD | W6 (6 liter bath tank) + KD Stirrer/Controller |
| W6-KA | W6 (6 liter bath tank) + KA Stirrer/Controller |
| W14-ZD | W14 (14 liter bath tank) + ZD Stirrer/Controller |
| W14-ZA | W14 (14 liter bath tank) + ZA Stirrer/Controller |
| W28-ZD | W28 (28 liter bath tank) + ZD Stirrer/Controller |
| W28-ZA | W28 (28 liter bath tank) +ZA Stirrer/Controller |
| W38-ZD | W38 (38 liter bath tank) + ZD Stirrer/Controller |
| W38-ZA | W38 (38 liter bath tank) + ZA Stirrer/Controller |

The KD and ZD controllers have digital temperature display and
and temperature setting

The KA and ZA controllers have analog temperature setting

| | |
|----|---------------------------------------|
| TD | (KD controller fitted with B/C clamp) |
| TA | (KA controller fitted with B/C clamp) |

The KD or KA controller can be fitted with a B/C clamp to enable it
to be used as an immersion thermostat on tanks with a capacity up to 50 liters.

| | |
|-----|----------------------------|
| C1G | Use with all W baths |
| C2G | Use with W28 and W38 baths |

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1. SAFETY

This equipment has been designed and constructed to comply with the electrical safety requirements of IEC 1010-1 (safety requirements for electrical equipment for measurement, control and laboratory use), and IEC-1010-2-010 (specification for laboratory equipment for the heating of materials). These International Standards are also published as European (EN 61010) and British (BS EN 61010) standards.

- ◆ Always obey the following safety precautions:



CAUTION: Read this documentation fully before use and pay particular attention to sections containing this symbol:

- ◆ CAUTION: Some surfaces can become HOT during high temperature operation.
- ◆ DO NOT CONNECT TO THE POWER SUPPLY OR SWITCH ON BEFORE FILLING THE TANK.
- ◆ Only connect to a power supply with a voltage corresponding to that on the serial number label.
- ◆ Connect the control unit only to a power supply which provides a safety ground terminal. Connecting to an ungrounded power supply is potentially dangerous.



Before moving, drain the bath and disconnect the power supply at the power supply socket. Do NOT remove the IEC connector from the rear of the unit.

- ◆ Ensure that the unit is positioned such that the power switch is easily accessible during use.
- ◆ The ventilation slots on the rear of the unit must not be blocked or restricted.
- ◆ Take care when topping off or draining, as the liquid in the tank may be hot.



If the **alarm lamp** is illuminated take care as the liquid may be at boiling point. DO NOT TOUCH the heater as it may be VERY hot. When refilling the bath be very careful. The heater may be hot and, when cold water comes into contact with it, the water can boil violently throwing off very hot droplets of water and scalding steam. USE SAFETY GLASSES.

- ◆ If the alarm lamp is illuminated and the heater is not immersed in liquid, DO NOT TOUCH IT - it will be very HOT. Do not place the control unit on a surface which is flammable.
- ◆ Do not check the liquid temperature by touch. Use the temperature display or an accessory thermometer.



Use only water or water/glycol mix. Do not use these liquids outside the specified temperature range. If the alarm lamp is illuminated and water/glycol mixture is being used, the temperature of the liquid may be above its recommended maximum temperature. DO NOT inhale the vapors given off from the hot liquids as they are TOXIC. If water/glycol mixture is heated above its recommended maximum, discard safely and replace with new liquid.

- ◆ Always use a lid or polypropylene spheres when operating above 60 °C. Take care when raising and removing the lid. The lid may be hot. Steam and hot vapors can cause scalding
- ◆ When working at high temperatures (greater than 60 °C), reduce the risk of eye injury by using safety goggles or spectacles.
- ◆ Before draining allow the liquid to cool to below 50 °C. Drain using a hand siphon pump (SYI).
- ◆ When pumping through or around external apparatus, always use connecting pipe or hose suitable for the operating temperature and liquid used, and check that the pipe connections are secure before switching on.
- ◆ Do not disconnect any pipes or hoses while they contain hot liquid.
- ◆ The bath should be used in a manner specified by this user manual, otherwise the protection provided by the equipment may be impaired.
- ◆ It is the user's responsibility to carry out any appropriate decontamination if hazardous material is spilled on or inside the equipment.

2. GETTING STARTED

2.1 Unpacking

Remove the packing materials carefully, and retain for future shipment or storage of the unit. Packs should contain:

2.1.1 KA, KD, ZA or ZD Controller

Extension shaft with fitter propeller
Pump pipe outlet plastic molding
Two 'O' rings
Operating instructions

2.1.2 TA, TD Immersion thermostat

Clamp B/C
Extension shaft with fitted propeller
Pump pipe outlet plastic molding
Two 'O' rings
The operating instructions

2.1.3 Baths

W6 bath with cover plate and lid
W14, W22, W28 and W38 baths with circulation tray

2.2 Assembling control unit

2.2.1 W6-KD and W6-KA

Use of KD and KA control units with W6 tank:

Remove the cover from the W6 tank by removing the two waisted nuts on the underside of the cover.

Check that the float is free and that any tape is removed.

Fit the control unit to the cover using the three M3 screws supplied.

Refit the cover to the tank locating it on the two brackets and securing it with the two waisted nuts.

Fit the flat stainless steel lid supplied.

Select the combination of holes on the lid which is suitable for the application, see figure 2.

2.2.2 W14-ZD, W14-ZA, W22-ZD, W22-ZA, W28-ZD, W28-ZA, W38-ZD and W38-ZA.

Use of controller ZD and ZA with tanks W14, W22, W28 or W38

For use with W28 or W38 tanks, remove the stirrer from underneath the pump, by removing the retaining M3 screw. Screw the shaft extension into the tapped hole on the end of the shaft, see figure 3.

Remove the two knurled nuts, see figure 4, from the bottom of the control unit and fit it onto the tank by locating the studs into the brackets on the tank. Secure in position by refitting the two knurled nuts underneath.

When operating at temperatures greater than 90°C, fit the HTS high temperature shield to the base of the unit by locating it on the fixing screws and the cooling coil support bracket.

Check that the circulation tray is correctly fitted, with the larger gap between the edge of the tray and the end of bath under the control unit. N.B. W6 has no circulation tray.

2.2.3 Immersion thermostats TD and TA

Use of control unit KD and KA with B/C clamp

Turn the control unit upside down and remove the three small screws around the edge of the base. Pass the coil through the hole in the B/C clamp, aligning the control unit so that the front faces away from the clamp knob. Fasten the unit with the three screws.

If the tank is deeper than 150 mm, remove the stirrer from underneath pump, by removing the retaining M3 screw, and screw the shaft extension with the propeller into the tapped hole on end of the shaft, see figure 3.

Clamp the controller to the side of your vessel. Vessel can be used with a maximum wall width of 30mm.

Take care not to overtighten the clamp if you are attaching it to a glass vessel.

WARNING: When using the immersion thermostat above 60°C, use a tightly fitting lid around the controller. The purpose of the lid is to prevent vapors from the hot liquid escaping to the atmosphere or being drawn into the controller with the cooling air. Hot vapors should not be inhaled. The lid also improves the heat up rate and reduces liquid evaporation.

2.2.4 Use of pump

To use the pump, remove the pump bypass molding and replace with the pump output molding, see figure 4.

Remove the two screws which hold the pump bypass molding to the control unit, and fit the pump output molding. Ensure that the two sealing 'O' rings are correctly fitted into their grooves before fitting. Retain the pump bypass with its larger 'O' ring for refitting when the pump is no longer required.

Connect the outlet pipe, marked with an upward arrow on the left hand pipe, to the external circuit. Connect the return pipe to the inlet pipe, marked with a downward arrow. Secure the pipes with clips.

The pump will pump liquid around a closed external circuit, which is one not open to the atmosphere. It cannot be used for circulation through an external open tank. The FH15/16 circulator or RRC range of refrigerated circulators can be used for this application.

When the pump is not required, refit the pump bypass, ensuring that the sealing ring is correctly fitted.

WARNING: If the operating temperature is greater than 60°C, ensure that the pipes are securely clamped to the pump outlet and to the external circuit, and that the tubing is suitable for the liquid temperature.

2.3 Use at lower temperatures.

Due to heat input from the pump and stirrer motor, the minimum operating temperature without accessory cooling depends on the size of the bath. The smallest bath, W6, has an operating temperature of approximately 15°C above ambient when used with a lid, or 10°C above ambient without a lid.

The other baths can be used to within 5°C of ambient without accessory cooling.

For lower temperature operation, accessory cooling is required. This can be either a refrigerated cooler C1G or C2G or a water cooling coil CW5. The CW5 can be used either with a refrigerated circulator or tap water, but when used with tap water, it should only be used in accordance with local water supply regulations.

C1G is suitable for use with all W baths and when used with immersion thermostats TA or TD for tanks deeper than 150 mm.

C2G is suitable for use only with W28 and W38 baths and when used with immersion thermostats TA or TD for tanks deeper than 200 mm.

Note: When using W baths at lower temperatures, condensation may form as the tanks are not insulated.

CW5 coil can be used in any bath deeper than 150 mm.

2.3.1 W6 tank.

Configure the lid for “cooling coil and thermometer” or “cooling coil only” as shown on figure 2.

Position the C1G cooling coil in the tank so that the feed pipe passes through the slot.

Note: The cooling coil is located in the working volume and, therefore, the unit can only be used for circulation.

2.3.2 W14, W22, W28, W38 tanks

Remove the control unit from the tank, and remove the small cover plate from the bottom of the unit (M3 screw) see figure 4.

Place the coil in the tank and position the control unit so that the cooling coil fits over the coil support bracket and its feed pipe passes through the entry channel of the control unit.

2.3.3 For use with immersion thermostats.

Position the cooling coil in the tank, ensuring that it is fully immersed. Clamp it in position.

3. OPERATION

3.1 Controls and indicator lamps

3.1.1 Power

The power (mains) switch is located on the rear panel.

If the unit does not come on, check whether the “alarm” lamp is illuminated (see 3.1.6).

3.1.2 Power lamp

The power lamp (green) on the front panel indicates that the mains power supply is on.

3.1.3 Heater lamp

The heater lamp (orange) on the front panel indicates when the heater is on. While the bath is warming up, the lamp is on continuously, and it starts to flash as the temperature reaches set point. When the unit is controlling at set temperature it flashes intermittently.

3.1.4 Temperature display

The temperature display normally shows the temperature in °C of liquid being controlled. It displays set temperature when the push to set °C knob is pressed.

3.1.5 Set temperature knob

KD, ZD: push to set °C

Press knob to change display from liquid temperature to set temperature, and at the same time rotate the knob to set the required operating temperature.

KA, ZA: set temperature

Turn the knob to the required temperature, lock with the lever. Use a screwdriver for fine setting over the range ± 1 °C.

3.1.6 Alarm Lamp

The alarm lamp (red) on the front panel illuminates when either the liquid level is low, or the over temperature cut-out has operated.

The low liquid level switch consists of a stainless steel float, and switches the heating and stirring off if the liquid level falls.

When the alarm lamp is illuminated, first check the liquid level and refill if necessary. If it is still illuminated, press the over temperature cut-out knob. If the alarm lamp does not go out, set over temperature as described in 3.3.

3.1.7 Set overtemperature knob

Set overtemperature (push to reset) control. The cut-out operating temperature is adjustable. If the liquid temperature rises above the cut-out set temperature the heater and stirrer are switched off. The cut-out is re-set by pressing the knob.

The front of the knob has a hole through which adjustment can be made with a screwdriver.

3.2 Filling

Before filling the bath, disconnect the power supply.

When the tank is fully loaded, fill to a maximum level of 10 mm from the top with a liquid suitable for your working temperature.

Before filling the bath, disconnect the mains power supply.

| | |
|--------------|--|
| -30 to 30°C | 50% water, 50% antifreeze (inhibited ethylene glycol) WARNING - TOXIC: Follow manufacturer's instructions For safe disposal consult your Local Environmental Health Office. |
| 0 to 30°C | 80% water, 20% antifreeze (inhibited ethylene glycol) WARNING: TOXIC: Follow manufacturer's instructions For safe disposal consult your local Environmental Health Office. Use a lid to reduce the dilution of the mixture caused by condensing water vapor from the air, and to maintain the cool down rate. |
| +5 to 80°C | Water, recommended temperature range. Use a lid or polypropylene spheres above 60°C to reduce evaporation and heat loss. |
| 80 to 99.9°C | Water can be used but care should be taken with its use as hot water vapor can be dangerous. A lid or polypropylene spheres must be used. At these temperatures the temperature control will be reduced due to localized boiling, and there may be a large loss of water due to evaporation. The control units should not be used to boil water. |

Note: Both water from a drinking source and deionized water is suitable for use in the baths. However, some older deionizers can create concentrated salt solutions for a short time after the ionizer is rejuvenated. This solution should not be used in the baths as it may cause corrosion.

70 to 150°C Dow Corning silicone fluid DC200/20
Follow manufacturer's instruction
For safe disposal consult your Local Environmental Health Office.

3.3. Switching on and setting up

Connect the pump to your external circuit if required.
Connect the control unit to a grounded electrical power supply with voltage and frequency within the range specified on the serial number plate.

DO NOT SWITCH ON BEFORE FILLING THE TANK.

Before switching on for the first time, use a screwdriver to turn the set overtemperature control fully clockwise. Press the knob to ensure that it is reset.

Switch the power on and check that the power lamp is illuminated.

On analog units, set the required operating temperature.

On digital units, press the push to set °C knob and rotate to set the required operating temperature.

Wait until the liquid temperature has stabilized at the operating temperature. After the temperature has stabilized at the required set temperature, set the overtemperature control as follows:

Turn the control counterclockwise, using a screwdriver, until the alarm lamp comes on. Press the knob to reset it and turn the control slowly clockwise until the alarm lamp goes out. This gives an overtemperature trip point of approximately 30°C above set temperature.

4. ACCESSORIES

4.1 Test tube racks

The following stainless steel test tube racks are available:

| Bath Tank | Racks per bath | Tube Diameter | Tubes / rack | | Catalog Numbers |
|-----------|----------------|--------------------|--------------|-----|-----------------|
| | | | QR | VR | |
| W6 | 1 X QR | 10 -13 mm | 30 | 65 | QR-10, VR-10 |
| W14 | 2 X VR | 16-19 mm | 16 | 36 | QR-16, VR-16 |
| W22 | 4 X VR | 24 mm | 10 | 23 | QR-30, VR-30 |
| W28 | 4 X VR | 30 mm | 5 | 14 | QR-30, VR-30 |
| W38 | 6 X VR | 0.5 ml μ tubes | 44 | 102 | QR-SE, VR-SE |
| | | 1.5 ml μ tubes | 35 | 75 | QR-LE, VR-LE |

4.2 Raised shelves

Raised shelves RS14, RS22, RS28 and RS38 are available for W14, W22, W28 and W38 tanks respectively. The raised shelves can be used with either end up in the bath to give different immersion depths. The immersion depth can be adjusted by changing the quantity of liquid in the bath.

4.3 Lids

4.3.1 Hinged lids LW14, LW28 and LW38

LW14 for W14 bath tank
LW28 for W22 and W28 bath tanks
LW38 for W38 bath tanks

The pack contains:

Lid (with upper part of hinge fitted)
2 hinges, lower half
4 screws

To assemble: Remove the 4 bungs from the side of the bath. Attach the lower half of the hinges to the bath with the screws provided, but do not tighten screws. Position the lid on the bath and check that lid opens smoothly and is correctly lined up with the side of the bath before tightening screws.

4.3.2 Stainless steel lids LS14, LS28 and LS38 lids.

Pitched lids: LS14 for W14 bath
 LS28 for W22 and W28 bath
 LS38 for W38 bath
 These lids are supplied with the handle detached from the lid.

The pack contains:
 Handle
 Adaptors: 2
 Screws: 2

To Assemble: Remove the protective film from the lid. Pass two screws through the holes in the lid. Thread the adaptors on to the screws, so that the 'v' cut fits over the ridge of the lid. Hold the handle in position against the adaptors and fasten to the lid by tightening the screws.

4.3.2 Polypropylene spheres (PS20)

Polypropylene spheres are an alternative to lids. They minimize evaporation and heat loss, allow easy access to vessels in the bath, and are particularly useful for tall vessels. One package contains approximately 300 spheres.

| Bath tank | W6 | W14 | W22 | W28 | W38 |
|------------------|----------|----------|----------|----------|----------|
| Spheres Required | 1 X PS20 | 1 X PS20 | 2 X PS20 | 2 X PS20 | 3 X PS20 |

4.4 Siphon SYI

A Siphon (SY1) can be used to drain the bath.

5. FAULT DIAGNOSIS

| Symptom | Possible Cause | Action Required |
|---|---|--|
| Unit does not operate | Unit not switched on | Switch On |
| Power lamp off | Unit not plugged into power supply | Plug in, switch on |
| | Fuse blown in the unit | Check and replace |
| | Electrical power supply failure | Check that other electrical appliances on the same circuit are working |
| Alarm light on | Overtemperature cut-out has operated | Reset cut-out as described in 4.6 |
| Temperature does not rise when expected | Set temperature is lower than liquid temperature | Check set temperature |
| | Temperature control circuit fault | Have unit checked by technician |
| Temperature continues to rise when not expected | Set temperature is higher than liquid temperature | Check set temperature |
| | Set temperature is too close to ambient | Raise the set temperature or add accessory cooling |
| | Temperature control circuit fault | Have unit checked by technician |
| Stirrer motor does not rotate | Stirrer or propeller obstructed | Clear obstruction |
| | Pump obstructed | Clear obstruction |
| | If stirrer motor shaft rotates freely, then motor thermal fuse may have blown | Have unit checked by technician |

6. TECHNICAL SPECIFICATIONS

This equipment is designed for indoor use in laboratory conditions, with room temperature between 5 °C and 40 °C, and 80% relative humidity. Performance figures quoted apply to equipment used in ambient temperature between 10 °C and 35 °C.

6.1 Heating

| | |
|-----------------------------------|----------------|
| TD, ZD temperature setting range: | -30°C to 150°C |
| ZD minimum operating temperature: | |
| W6, W14 and W22: | 0°C |
| W28 and W38: | -15°C |
| TA, ZA temperature range: | 0 to 150°C |

With a suitable insulated tank and cooler the ZD and TD units can control liquid temperatures down to -30°C.

Stability (DIN 58966) at 37°C: $\pm 0.004^{\circ}\text{C}$

Supply voltage range: 220-240V: 50/60Hz
110-120V: 50/60Hz

Power rating: 230V 1.5 kW
115V 1 kW

Heater power: 230V 1.4 kW
115V 0.96 kW

Overtemperature protection is by variable resettable overtemperature cut-out.

Low liquid level is sensed by float switch.

Pump performance:
Max. Head 1.7m
Max. Flow 8.5 lit/min at zero head.
Pump bore 6mm

This equipment is for indoor use and will meet its performance figures within an ambient temperature range 10 to 35°C with maximum relative humidity of 80% and is safe for use in an ambient temperature up to 40°C.

Heat up time in minutes from 25°C to 70°C with water and lid on:

| | W6 | W14 | W22 | W28 | W38 |
|-------|----|-----|-----|-----|-----|
| 115 V | 16 | 35 | 53 | 70 | 100 |
| 240V | 10 | 25 | 38 | 50 | 70 |

6.2 W-Series Bath Tanks

| | W6 | W14 | W22 | W28 | W38 |
|-------------------------------|-------------|-------------|-------------|-------------|-------------|
| Tank Capacity (L) | 6 | 14 | 22 | 28 | 38 |
| Tank Dimensions l/w/d (mm) | 300/150/150 | 325/300/150 | 505/300/150 | 505/300/200 | 690/300/200 |
| Liquid depth, min/max (mm) | 80/140 | 70/130 | 70/130 | 120/180 | 120/180 |

*Maximum depth can be increased by 10mm, by removing the circulation tray in 14, 22, 28 and 38 liter baths, with slight loss of performance.

6.3 Cooling - C1G, C2G

Refrigerated cooler for use in liquids between -20 °C and 40 °C.

The cooling coil may be immersed in liquids up to 100 °C, but the cooler should not be switched on with liquid temperatures above 40 °C.

Immersed material: the cooling coil is nickel-plated copper.

| | | C1G | C2G |
|----------------------|--------|-------------------------------|----------------|
| Cooling power | @20 °C | 300 W | 350 W |
| | @0 °C | 100 W | 250 W |
| Overall consumption | | 200 W | 400 W |
| Dimensions | | 410/285/225 mm | 475/320/255 mm |
| Flexible pipe length | | 925 mm | 925 mm |
| Coil diameter/length | | 77/55 mm | 75/105 mm |
| Electrical supply | | 110-120 VAC or 220-240 VAC | 220-240 VAC |

7. MAINTENANCE AND SERVICE

All Science/Electronics laboratory products are designed to comply with IEC1010-1 and can be flash tested. Some are fitted with radio frequency interference suppressors - Therefore it is recommended that only a d.c. test is performed.

7.1 Cleaning

No routine maintenance is required.

For service, obtain an RMA number, remove the control unit and return to our service department. **DO NOT RETURN THE TANK OR BRIDGE PLATE.**

The cases can be cleaned with a damp cloth after disconnection. Do not use solvents. The immersed parts can be cleaned using proprietary heating element cleaners. **CAUTION:** these may be toxic - follow the cleaner manufacturer's instructions.

Before using any decontamination or cleaning method except that recommended, check with our Service Department, or in other countries with our distributor, that the proposed method will not damage the equipment.

7.2 C1G, C2G

Cooling power will be reduced if the fins behind the grill become clogged with dust. Examine monthly and if necessary use a vacuum cleaner to remove dust. If still clogged, contact a technician.

No other routine maintenance is required.

Disposal:

This unit contains refrigerant gas, which must NOT be discharged into the atmosphere. At the end of the units working life, either have the gas removed safely by using refrigerant recovery equipment or return the unit to us for disposal.

7.3 Replacement of fuses

Disconnect the unit from the power supply socket.

Remove the IEC power plug from the rear of the unit.

Press down the drawer catch (see figure 6).

Pull out the fuse drawer, check and replace with the correct fuses if necessary, as follows:

1.25 x 0.25 inch quick acting rated:

| | |
|-----------------|----------------|
| ZA, ZD, KA, KD: | 220-240V: 10AF |
| | 110-120V: 15AF |

| | |
|------|----------------|
| C1G: | 220-240V: 5AF |
| C2G: | 220-240V: 10AF |

Replace fuse holder.

8. WARRANTY

When used in laboratory conditions and according to this user manual, this equipment is warranted for THREE YEARS against faulty materials or workmanship.

9. SERVICE

It is necessary that a Returned Materials Authorization (RMA) number and form be obtained before return of any Science/Electronics product for any reason. Contact us for more information. Please be sure to mark the outside of the returned goods package with this RMA number to ensure prompt handling.

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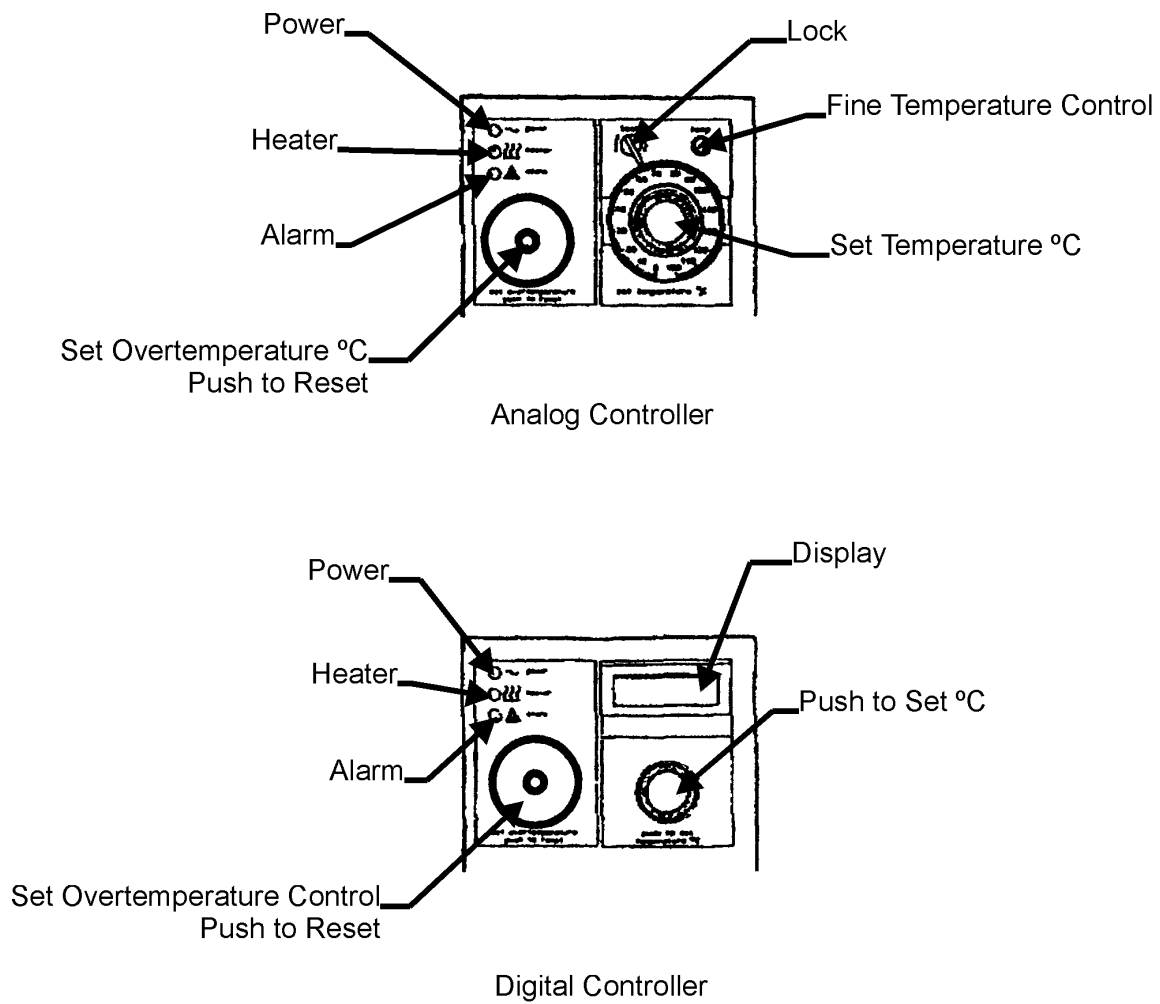


Figure 1 - Identification of Controls

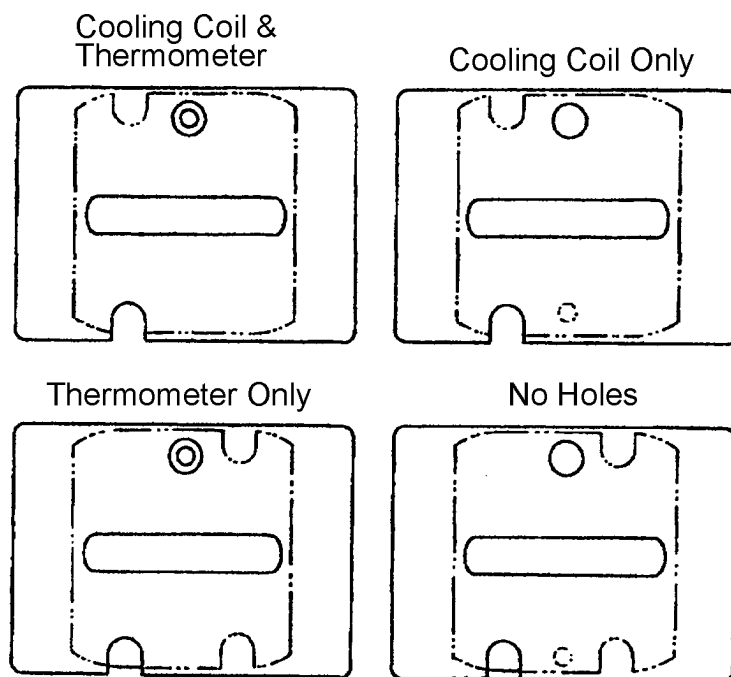


Figure 2. Different configurations for W6 lid

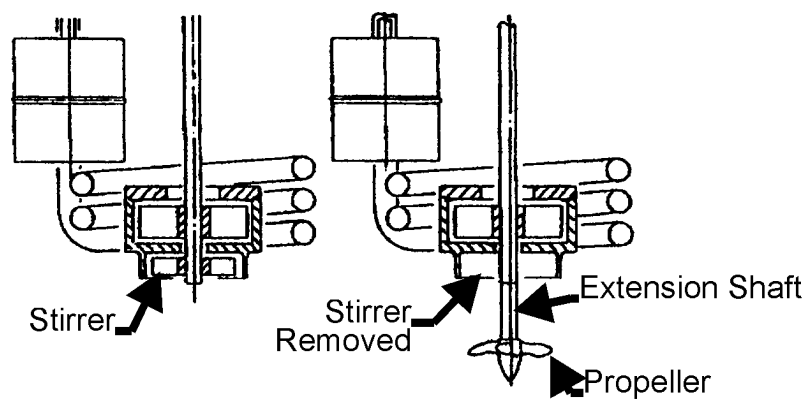


Figure 3. Stirrer Shaft Extension

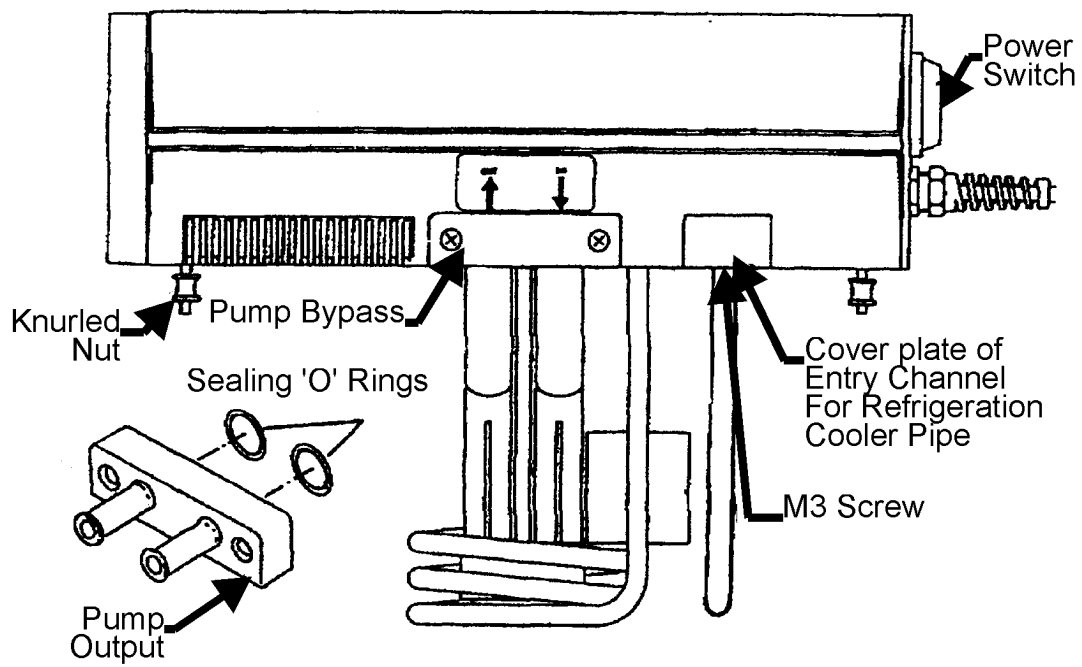


Figure 4. Side View of Controller